

# A High Throughput System for Multichannel Neurophysiology

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**Challenge/Problem:** Recent technical developments have made simultaneously recording the activity of many neurons possible. We will develop and ultimately deliver to market a high-throughput data acquisition platform designed to support and extend these types of high-count multichannel investigations. Our DSP-based platform will serve as an enabling technology for acquiring and pre-processing large numbers of derived data sets from complex or high channel count neurophysiology recording systems. The successful delivery of a high throughput system for neurophysiology will increase data yield, speed analysis, reduce animal use, and allow fundamental questions about simultaneous neural activity and functional connectivity to be addressed.

## Progress:

Since the proposal submission (4/1/05), we have developed an upgraded version of our RX5 processor designed to serve as an interim to the proposed PCI-compatible DSP processing board supporting high-count single-unit acquisition. The stand-alone device has a different architecture than the proposed PCI device, but offers proof of concept and proves out a number of elements critical to Phase I development, (e.g.) a high-throughput fiber optic communication protocol.

## Approach:

To support high count research, we will develop a very high throughput system for multichannel neurophysiology. This new design will utilize the best advantages of our existing hardware and software designs and eliminate current bottlenecks. Our ultimate goals for this project are: (1) to streamline data acquisition by producing a dedicated system designed to process and record many channels of neurophysiological data, controlled and analyzed by a single monitor PC, and (2) to minimize post-hoc analysis of these very large data sets by allowing for efficient real-time signal conditioning, spike sorting, data display, and analysis on a novel new dedicated digital signal processing (DSP) platform.

## Current/Near Term Products:

RZ2 and PZ2 high-count processor and preamplifier: scheduled for release mid-2006.

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## Future Plans:

We will:

- o Finish out and deliver to market the RZ2 and PZ2 devices
- o Develop micro-miniature, zero insertion force, elastomeric electrode and headstage connectors.
- o Develop new low noise headstages with an overall size < 50% that of our current offerings.
- o Develop supple, lightweight, flex cable connection between the headstages and preamplifier.
- o Develop a PCI-compatible DSP processing board supporting high-count single-unit acquisition as a foundation to further Phase II development of a very high-count dedicated platform.

**Keywords:** multichannel neurophysiology, neural prosthesis, digital signal processing, headstages, connectors